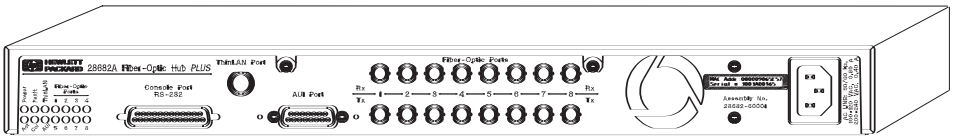
HP Fiber-Optic Hub Plus

Installation and Reference Guide



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Safety Considerations

The product and related documentation must be reviewed for familiarization with safety markings and instructions before installation and operation. See the documentation section entitled “Safety Information”.

Informations concernant la sécurité

Ce produit et la documentation s’y rapportant devront être étudiés avant l’installation et l’utilisation, afin de se familiariser avec les symboles et instructions de sécurité. Reportez-vous à la section «Informations concernant la sécurité».

Hinweise zur Sicherheit

Sehen Sie sich das Produkt an und lesen Sie die begleitende Dokumentation, damit Sie vor der Installation und dem Betrieb mit den Sicherheitsmarkierungen und Anleitungen vertraut sind. Bitte lesen Sie das Kapitel mit der Überschrift “Hinweise zur Sicherheit”.

Considerazioni sulla sicurezza

Esaminare il prodotto e la relativa documentazione per familiarizzarsi con gli avvisi e le istruzioni di sicurezza prima dell’installazione e dell’uso. Vedere la sezione di questo documento intitolata “Considerazioni sulla sicurezza”.

Consideraciones sobre seguridad

Antes de instalar y hacer funcionar el producto, se deben estudiar el producto y la documentación relacionada a fin de familiarizarse con las indicaciones de advertencia e instrucciones. Ver la sección del documento titulada “Consideraciones sobre seguridad”.

HP 28682A

HP Fiber-Optic Hub Plus

Installation and Reference Guide

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In This Guide

This guide contains information to help you install, configure, and troubleshoot your HP 28682A Fiber-Optic Hub Plus. The guide is organized as follows:

Chapter 1 provides a brief introduction to the hub. It describes important product features, what you should have received with your hub, and an overview of how the hub works.

Chapter 2 provides hub installation instructions. It describes, in detail, the steps that you should follow to install the hub.

Chapter 3 describes all the hub's console interface commands.

Chapter 4 contains troubleshooting information. If you experience problems with the hub, you should refer to this chapter.

Appendix A provides information on the cables and connectors that you should use to connect the hub to the other devices in your network.

Appendix B contains the technical specifications for the hub.

Appendix C describes how to configure commonly found modems for use with the hub's console connection.

Appendix D provides information on network addressing for those using SNMP network management stations to manage the hub over an IP or IPX network.

Appendix E provides information on establishing a backup connection for a critical link to another hub in your network topology.

Safety Information contains safety information about the hub. *You should read and understand this information before you use the product.*

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1

Introducing the HP Fiber-Optic Hub Plus

The HP 28682A Fiber-Optic Hub Plus is a 10-Mbit/s multiport repeaters and is designed to be compatible with the IEEE 802.3 Fiber-Optic Inter-Repeater Link (FOIRL) standard. It can form a fiber-optic star backbone with HP EtherTwist or other Type 10Base-T subnetworks, or in combination with thin or thick coaxial cable networks. Or, it can directly connect PCs and computers that have a fiber-optic adapter card or a fiber-optic transceiver attached. See the *HP EtherTwist Technical Reference Guide* (p/n 5091-3237E) for network configuration guidelines.

Features

The HP Fiber-Optic Hub Plus has the following features:

- The following ports:
  - Eight fiber-optic ports, each consisting of a transmit and receive pair of ST connectors for 62.5/125 µm or 50/125 µm fiber-optic cable.
  - A ThinLAN port for connection to thin LAN coaxial cable.
  - An AUI port for connection to an external transceiver. This additional port can be used with the appropriate transceiver to connect any media, such as twisted-pair, thick or thin coaxial, and fiber-optic cable. It can be used at the same time the other ports are being used.

    Note that all the network ports (fiber-optic, ThinLAN, and AUI) are active and can be used at the same time.
  - An RS-232-C console port for attaching a terminal or terminal emulator that can be used to customize the hub's configuration, monitor hub activity and status, and run tests of the hub. Console access can be either local, by direct attachment to the console port, or remote, through a modem connection.

Features (continued)

- Compatibility with the IEEE 802.3 Fiber-Optic Inter-Repeater Link (FOIRL) standard and support for both IEEE 802.3 and Ethernet protocols.

- Automatic segmentation of ports that are experiencing network communication problems. This improves network integrity and aids in fault isolation. Segmented ports automatically resume operation when the problems are corrected. (See "Auto-Segmentation" later in this chapter.)

- Support for a backup link to another hub (an automatically-activated redundant connection) to enhance network fault tolerance.

- A self-test for fault identification when the hub is powered on or when reset from the console or from a network management station.

- LEDs on both the front and back panels for easy interpretation of the hub's status.

- A power supply that automatically adjusts to the voltage range of the ac power being supplied to the hub (90-120 volts or 200-240 volts). No voltage range setting or fuse change is needed.

- A factory assigned station address (also called MAC address, Ethernet address, or physical address) allowing the hub to respond to 802.2 Test packets. The hub can also be configured with an IP address and can respond to an ICMP Echo Request message (also called "Ping").

- Can be managed remotely from a network management station that supports SNMP over IP (using the configured IP address) or IPX. (See "Network Management" later in this chapter.)

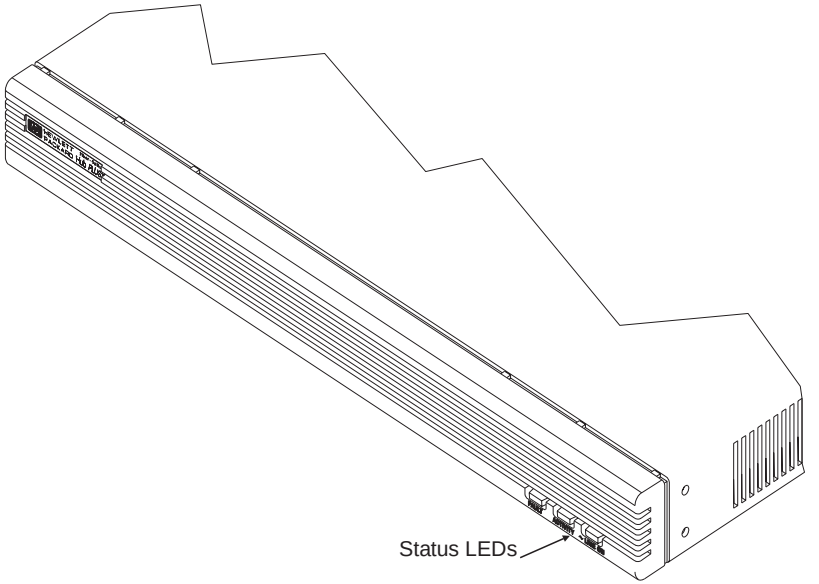
- Can be downloaded with new firmware enhancements either from a PC attached to the console port or over the network. (See "Firmware Enhancements" later in this chapter.)

- Comes with metal brackets that can be easily attached to the hub for mounting it in a standard 19-inch telco rack or on a wall.

Included Parts

- HP 28682A Fiber-Optic Hub Plus (28682-60001)
- Accessories kit (5062-9312), including:
  - two mounting brackets (5001-5624)
  - four 10-mm #M4 screws (0515-0780)
  - four 5⁄8-in #12-24 screws (2940-0238)
  - AUI retainer (5062-3351)
  - four self-adhesive rubber feet (0403-0427)
  - Velcro BNC “T” connector cover (1252-1650)
- *HP Fiber-Optic Hub Plus Installation Steps* (28682-90002)
- *HP Fiber-Optic Hub Plus Installation and Reference Guide* (28682-90001)
- Power cord, one of the following:
  - United Kingdom (8120-1351)
  - Australian (8120-1369)
  - European (8120-1689)
  - United States/Canada 125 V (8120-1378)
  - United States/Canada 250 V (8120-0698)
  - Swiss (8120-2104)
  - Danish (8120-2956)
  - Japanese (8120-4753)
  - South Africa (8120-4211)

Front of the Hub



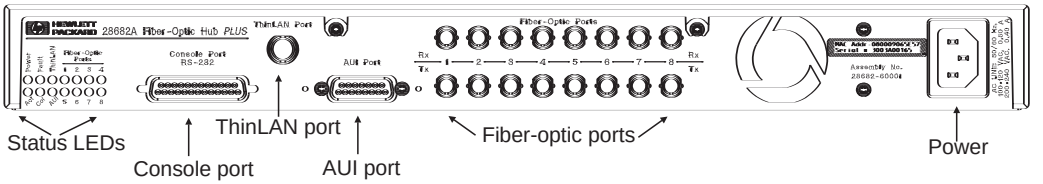
Status LEDs

Line On (green) is ON if the hub is receiving power.

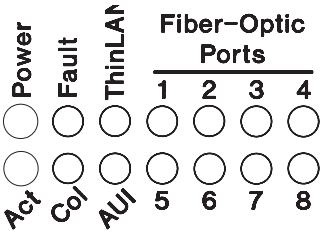
Activity (green) is ON when data is being transmitted. The frequency shows the amount of traffic. In heavy traffic, it may appear on all the time.

Fault (yellow) is ON if the hub is faulty and needs to be replaced, FLASHING if a port has been auto-segmented. (See "Auto-Segmentation" later in this chapter.)

Back of the Hub



Status LEDs



Power (green) is ON if the hub is receiving power. (This is the same as **~Line On** on the front.)

Act – activity (green) is ON when data is being transmitted. The frequency shows the amount of traffic. In heavy traffic, it may appear on all the time. (This LED is repeated on the front.)

Fault (yellow) is ON if the hub is faulty and needs to be replaced, FLASHING if a port has been auto-segmented. (This LED is repeated on the front.)

Col – collision (yellow) is ON when collisions (two or more nodes trying to transmit on the network at the same time) are detected on any of the attached cable segments. If collisions are infrequent (which is normal), the light may be imperceptible. If it appears on continuously, see chapter 4, “Troubleshooting”.

Port LEDs (green), one for each network port, fiber-optic ports 1 through 8, ThinLAN port and AUI port, are ON when the corresponding port is enabled and functioning normally. Ports can be enabled and disabled using the Port command on the hub’s console. The AUI port LED is always ON when that port is enabled, even if it is not being used. Each Port LED will FLASH if the port has been auto-segmented (see “Auto-Segmentation” later in this chapter).

How the Hub Works

The HP Fiber-Optic Hub Plus is a multiport repeater. Data signals coming into the hub from any of its ports are automatically regenerated and transmitted to all the other hub ports. The hub regenerates the data without interpreting the contents, so it can be used in either IEEE 802.3 or Ethernet networks and with any upper-level protocol.

Collision Detection

The hub performs collision detection. A collision occurs when two nodes try to transmit at the same time. When the hub detects this, it stops repeating the colliding transmissions and starts transmitting a jamming signal. The jamming signal tells the transmitting nodes that a collision has occurred. The colliding nodes then stop transmitting for a random amount of time before attempting to retransmit the data. Once the collision condition is removed, the hub stops transmitting the jamming signal and normal operation is restored.

Auto-Segmentation

The hub will automatically disable (auto-segment) a port if it experiences excessive collisions (greater than 30 consecutive collisions). The port will automatically return to operation if the excessive collision condition is removed and normal traffic is restored. Auto-segmentation can also be caused by improper termination of cabling attached to the AUI or ThinLAN ports, or by having nothing connected to the ThinLAN port when it is enabled.

If a port is auto-segmented, its port LED and the Fault LEDs will flash. A segmented ThinLAN port will not cause the Fault LED to flash unless Thinwatch has been explicitly enabled with the Thinwatch console command. The Thinwatch command is described in chapter 3.

If a port is auto-segmented, only the LAN segment attached to that port is affected. The other LAN segments will operate normally.

If a port is disabled explicitly, by using the console port or from an HP network management station, it must be enabled explicitly. It will not be enabled automatically.

Firmware Enhancements

Hewlett-Packard continually tests and improves its products. When firmware enhancements are made to the HP Fiber-Optic Hub Plus, you will be able to easily update it with the new code. The update can be made from a PC attached to the hub's console port (directly or through a modem), or the hub's new code can be downloaded over the network. The update procedures are described in documents that come with the new code.

Contact your HP-authorized LAN dealer or local HP sales office for the latest on firmware enhancements to this hub.

Network Management

The HP Fiber-Optic Hub Plus has software that allows it to be managed remotely by any network management product that complies with the Simple Network Management Protocol (SNMP) standard. HP offers SNMP-compliant network management products; both DOS-based and UNIX-based versions are available. These products use a windows interface to:

- manage multiple HP hubs and other HP network devices
- automatically generate a graphic display of the network map
- gather network traffic statistics
- configure ports
- run tests of the hub
- test network links to other devices

Note The functionality provided by HP network management products is improved on a regular basis. For more information on the capabilities of these products, contact your HP-authorized LAN dealer or local HP sales office.

Network Address. The communication between the hub and the network management station requires that the hub be assigned a *network address*. If you are using your hub in a Novell NetWare network, it can be automatically configured with an IPX address from an IPX router on the network. The hub is preconfigured to enable this function. Alternatively, if you are using the hub in a network that uses the Internet Protocol (IP), you manually configure the hub with an IP address using the hub console's IP command. See the IP command description in chapter 3, "Operation", and appendix D, "Network Addressing", for more information on configuring a network-layer address on the hub.

When configured with an IP address, the hub can also send and respond to network-layer test packets (ICMP Echo Request, or "Ping" packets).

Using Non-HP Network Management. To manage the HP Fiber-Optic Hub Plus with a non-HP network management product, you must first obtain HP's Network Management Information Base (MIB) extensions. The HP MIB extensions are available on request. Contact your HP-authorized LAN dealer or local HP sales office.

2

Installation

This chapter describes how to install and configure the HP Fiber-Optic Hub Plus, and verify that it is operating correctly.

Installation Summary

The steps to install the HP Fiber-Optic Hub Plus are:

1. Mount the hub (in a rack, on a wall, or on a table).
2. Plug in the hub and verify its operation.
3. Connect the hub to the networks and network devices.
4. Customize the hub's configuration if necessary (for example, because you want to turn off the unused ports, or because the hub will be managed remotely from a network management station on an IP network).

The details for these steps are provided in the rest of this chapter.

Tools and equipment needed for mounting the hub in a rack or on the wall:

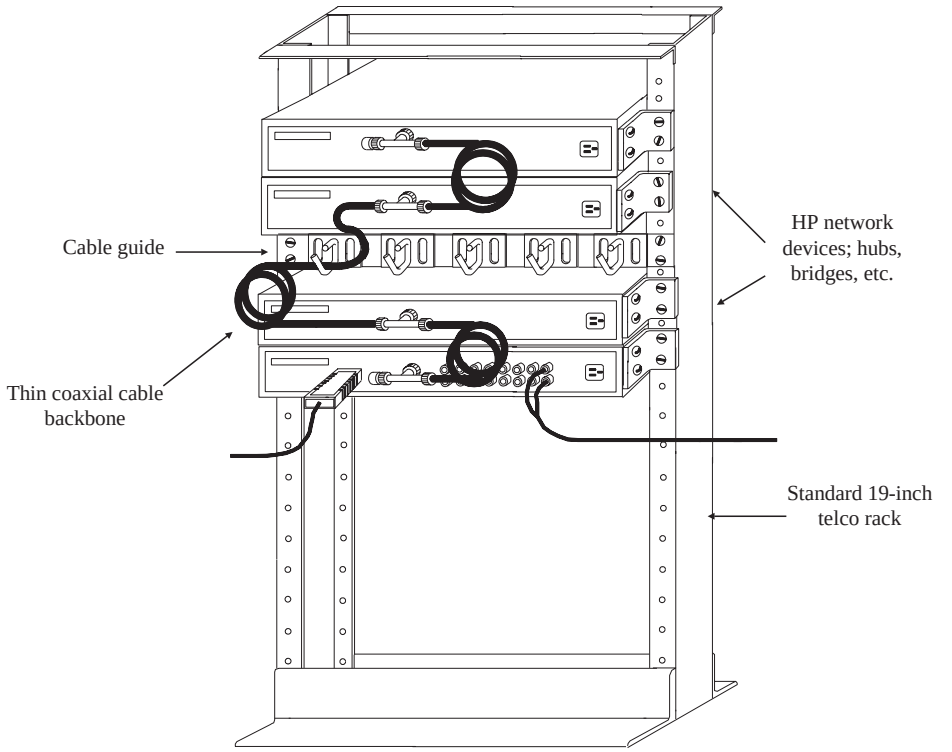
- Phillips (cross-head) number 1 screwdriver (for rack or wall mounting)
- four 5⁄8-inch number 12 wood screws or equivalent (for wall mounting only)

1. Mount the hub

1. Make sure the hub's power cord is correct for your country's ac power supply. Do *not* plug the power cord into the power supply until the hub is mounted. (Note that the hub does not have a power switch; the hub is powered on when the power cord is plugged in.)

2. As described on the next page, mount the hub in a rack or on a wall by using the mounting brackets, or place it on a table.

Before mounting the hub, plan its location and orientation relative to other devices and equipment. Also consider management of the cabling you will be attaching and consider access to the ports you will be using. In the example below, the hub is mounted in a rack with other HP EtherTwist family devices and a cable guide unit. Order the HP EtherTwist LAN Rack (HP 46298D) and the Cable Guide (HP 35199D). If you are using a modular adapter on an EtherTwist hub, position that hub at least one rack unit apart from any HP Fiber-Optic Hub Plus for easier port access.

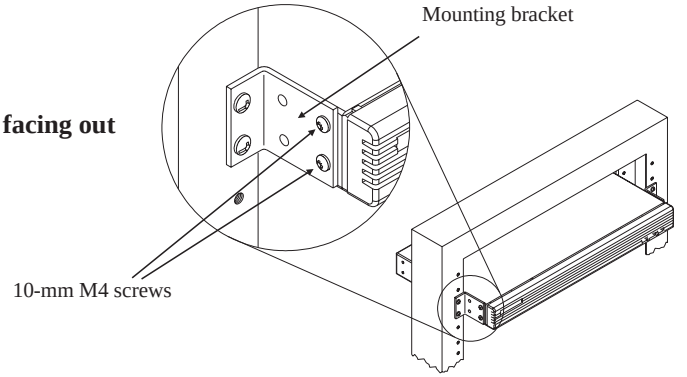


For Rack or Cabinet Mounting:

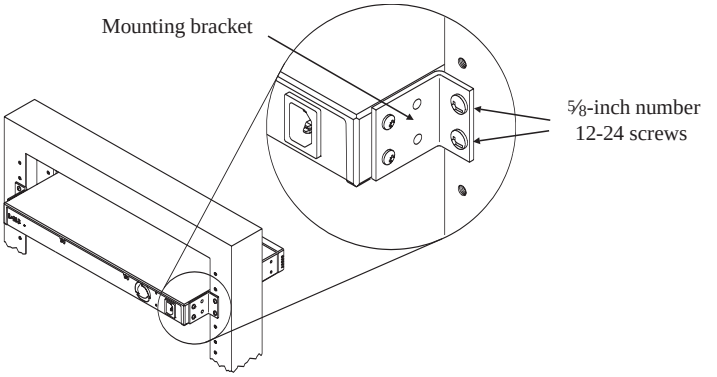
1. Using a Phillips or cross-head screwdriver, attach the mounting brackets to the hub with 10-mm M4 screws (included in accessory kit). Note that the hub's case and the mounting brackets are designed to allow you to rack mount the hub with either the back or the front facing out.

2. Position the hub in the rack or cabinet and slide it up or down until the rack holes line up with the bracket holes. Then attach the hub to the rack with 5⁄8-inch number 12-24 screws (included in the accessory kit). (Some cabinets require number 10-32 screws instead, available as p/n 2680-0302. Make sure you have screws that fit your cabinet or rack before mounting the hub.)

Front facing out

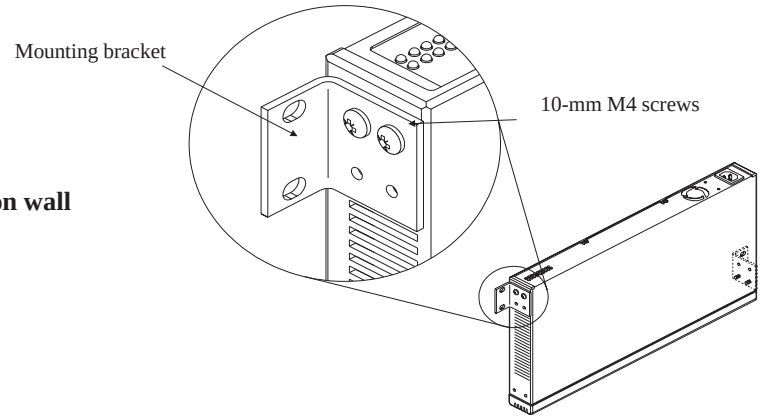


Back facing out

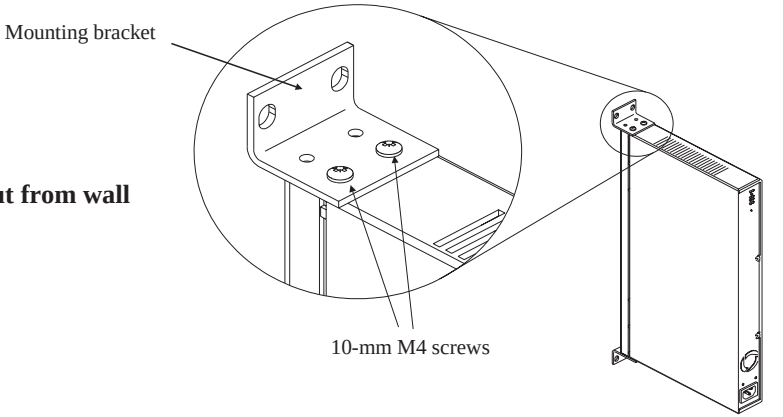


For Wall Mounting: Using a Phillips or cross-head screwdriver, attach the mounting brackets to the hub with 10-mm M4 screws (included in the accessories kit). Then attach the hub to a wood surface (minimum ½-in. plywood or equivalent) with ⅝-inch number 12 wood screws or equivalent (not included).

Flat on wall



Straight out from wall



For Table Mounting: Attach the self-adhesive rubber feet to the bottom of the hub. Set the hub on a table near a power source.

2. Plug in the hub and verify its operation

1. Plug the power cord into the hub's power socket and into an ac power source. *Note that the hub does not have a power switch; the hub is powered on when the power cord is plugged in.*

   The HP Fiber-Optic Hub Plus has a power supply that automatically adjusts to any ac power source that provides between 90 and 240 volts. No voltage range setting is necessary.

2. Check the LEDs on the hub's back panel.

   When you plug in the hub, it executes a self-test and illuminates all the LEDs for approximately ten seconds. At the end of the self-test you should see the following LED pattern:

   – The Power LED is ON.

   – The Fault LED is OFF.

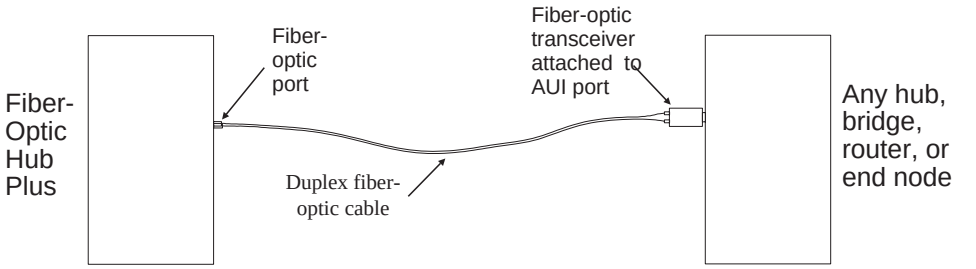
   – Disregard the other LEDs until you have attached the LAN segments to the network ports.

   If the LED pattern is different, refer to "Diagnosing With the LEDs" in chapter 4, "Troubleshooting".

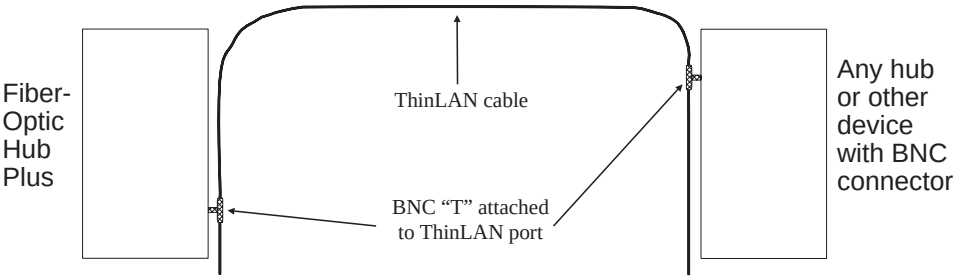
3. Connect the hub to devices and networks

You can connect the hub to another HP hub or bridge in three ways shown below. You can directly connect a computer in the first way shown. Note that fiber-optic cabling may pass through intermediate connector panels. See the *HP EtherTwist Technical Reference Guide* (p/n 5091-3237E) for information on the number of other hubs that can be connected (called cascading hubs), cable segment length limits, and other topology limitations.

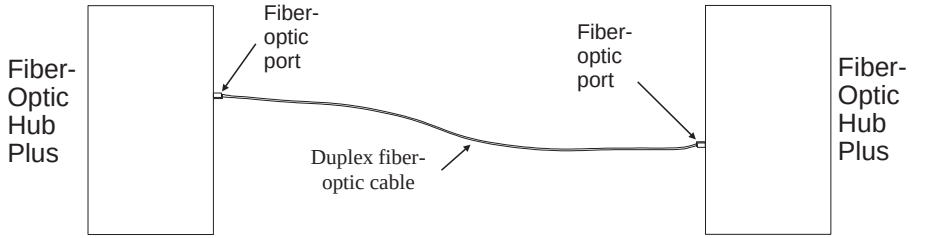
Fiber-Optic Port to AUI Port



ThinLAN Port to ThinLAN Port



Fiber-Optic Port to Fiber-Optic Port



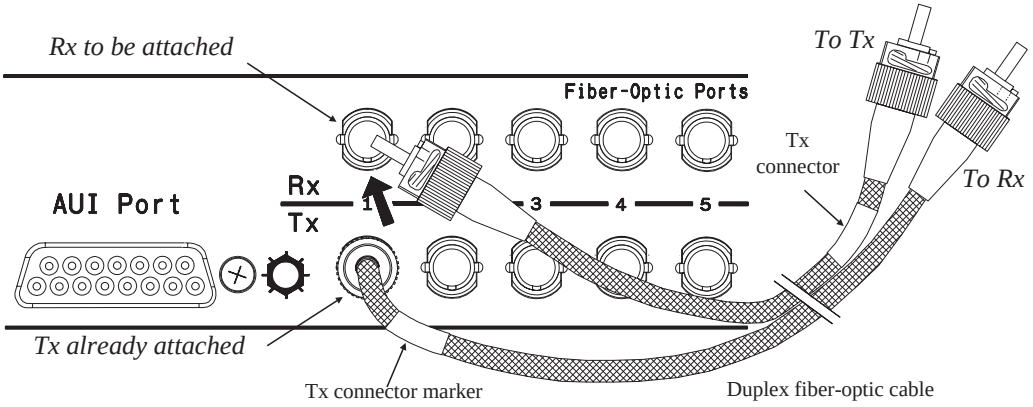
Port Connections

Fiber-Optic Port

To connect the duplex fiber-optic cable to the hub, attach one of the two fibers between the hub's "transmit" port (labeled "Tx") and the "receive" port of the other device, such as a transceiver. Attach the other fiber between the hub's matching receive port (labeled "Rx") and the transmit port of the other device.

If one fiber on this end of the cable is marked, such as with a white sleeve, attach it to the hub's Tx port. Attach the unmarked fiber to the hub's Rx port. Use the same convention at the other end of the cable. (At the other end, the marker is on the other fiber.)

For detailed instructions on attaching ST connectors, see the next page.



Caution The bend radius of the fiber-optic cable must be 50 mm (2 inches) or greater. Do not wrap the cable around sharp edges. The cable must be free of kinks, twists, and jacket irregularities. Cable connectors and hub receptacles that are not in use should be covered with dust covers.

To attach an ST-type connector:

1. Remove the plastic dust covers, if present, from the cable's connector and the hub's receptacle.

2. Align the small key on the inner shaft of the cable's connector with the slot at the *bottom* of the hub's receptacle.

3. Push in to slide the key into the slot. Then twist the outer cap clockwise until the two keys at both sides of the receptacle fit into the two slots on the cap. Continue to push in and then twist clockwise until the keys are held in the cap's slots.

To remove an ST-type connector from a receptacle:

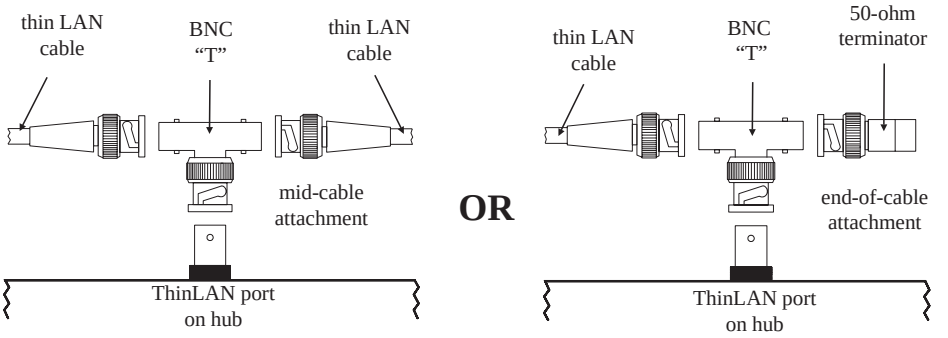
1. Grasp the outer cap with thumb and forefinger above and below. (It is easier to fit either your thumb or forefinger between the horizontal rows of receptacles, than to fit your fingers between connectors at left and right.)

2. Push in and twist the cap counterclockwise. This releases the receptacle's keys from their slots at both sides.

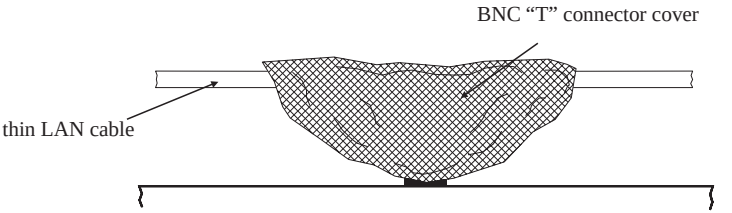
3. When the keys are released, pull the connector until it is completely free. Use dust covers on connectors and receptacles that are not in use.

ThinLAN Port

1. Attach a thin LAN cable section to one side of a BNC “T” connector.
2. Attach another thin LAN cable section ***or*** a 50-ohm terminator to the other side of the “T” connector.
3. Attach the “T” connector to the ThinLAN port.



4. Fold the BNC “T” connector cover around the connection, and squeeze the surfaces together around the edges.

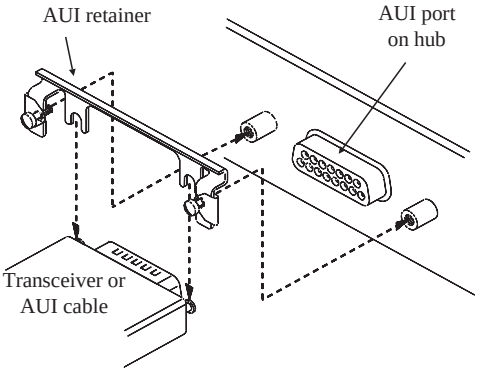


Note Each thin LAN cable segment must be terminated with a 50-ohm terminator at each end. In the illustration above showing the ThinLAN port at the end of a cable segment, the 50-ohm terminator is attached to one side of the BNC “T” connector.

AUI Port

Caution Do not touch the hub connector pins or the cable connector pins. Static discharge may damage the equipment.

1. Disable the SQE Test (signal quality error, or "heartbeat", test signal) and Loopback Test options, if present on the transceiver. See Note below.
2. Slide the AUI retainer (included) onto the connector posts on a transceiver or an AUI cable.
3. Plug the transceiver or AUI cable into the AUI port on the hub and secure it with the retainer's screws. Tighten the screws until they are snug; *do not overtighten them*.
4. Attach the network cable to the transceiver.



Note **Disable SQE Test on Transceiver.**

Any transceiver used with this hub must allow disabling the SQE test.

An HP 28641A ThinMAU does not meet this requirement and cannot be used. Instead use an HP 28641B ThinLAN Transceiver.

Similarly, an HP 30241A ThickMAU with date code D-3017 or earlier cannot be used. (The date code is found on a small white sticker on the body of the device. Lower numbers indicate an earlier manufacturing date.) Instead, use an HP 30241A with date code F-3105 or later, and follow the instructions that are included with the ThickMAU for disabling SQE test.

4. Customize the hub's configuration (if needed)

No changes to the hub's default configuration are required for the hub to operate correctly. The HP Fiber-Optic Hub Plus has a console interface for customizing the configuration, monitoring hub activity, and running diagnostics.

To configure the hub, first connect a terminal or PC emulating a terminal, as described under "Console Connection" below. Then, use the console interface to change the desired hub configuration parameters. The commands that you can use to change the hub's configuration are listed and described later in this section under "Configuration Commands".

(The hub can also be configured over the network from an HP network management station. See the network management product documentation for more information.)

Console Connection

Connect a terminal to the hub's console port directly or through modems, as described below.

Connecting a Terminal Directly

1. Connect a terminal, or a PC emulating a terminal, to the console port using an RS-232-C cable. (For pin-outs and recommended cables see appendix A, "Cables and Connectors".)

2. Switch on the terminal's power, or switch on the PC's power and start the terminal emulation program. Configure the terminal for 8 bits per character, 1 stop bit, no parity, Xon/Xoff handshaking, and a baud rate of 9600, 2400, 1200, or 300.

3. Press RETURN several times for the prompt, =>. The baud rate for communication between the hub and the terminal is set automatically when you press RETURN.

Connecting a Modem and Terminal

1. Use a full-duplex, asynchronous (character-mode) modem only. The following modems have been tested at their rated speeds:

   - HP 37212B Support Link
   - HP 35031A Support Link II
   - HP 50759A Support Link
   - Hayes 1200 Smartmodem
   - Racal Vadic Maxell 2400VP (Hayes 2400 compatible)
   - Black Box V.32 9600 Baud.

2. Configure the modem as described in appendix C, “Modem Configuration”.

3. Connect the modem to the console port using an RS-232-C modem cable. (For pin-outs and recommended cables see appendix A, “Cables and Connectors”.)

4. At the remote site, connect the terminal, or PC emulating a terminal, to the remote modem. Make sure the terminal and modems are functioning properly, then establish the link between the terminal’s modem and the hub’s modem according to the modem instructions.

5. Press RETURN several times for the prompt =>. The baud rate for communication between the hub and the terminal is set automatically when you press RETURN.

If You Have Trouble with a Terminal or Modem Connection

If you have connected a terminal or modem according to the previous instructions, and you do not get a prompt after you have pressed RETURN several times, then try the following procedures in sequence until you get the prompt:

1. Connection Reset Procedure:

1. Detach, then reattach the console or modem cable from the hub.
2. Press RETURN several times for the prompt.

2. Cycle Power Procedure:

1. Cycle power on the hub by unplugging the power cord and plugging it in again.
2. When the power-on self-test is done, press RETURN several times for the prompt.

3. Adjust Baud Rate Procedure:

1. Temporarily set the baud rate in the terminal's own configuration to 2400.
2. Press RETURN several times for the prompt.
3. Set the hub's baud rate to the desired rate (for example 9600) by using the console's Speed command (see "Console Commands" in chapter 3).
4. Set the terminal's configuration to this new baud rate, and press RETURN again for the prompt.

4. Test Console Port Procedure:

1. Detach the console cable from the hub. Attach the console port's loopback connector to the hub. (HP part no. 5062-3355—see appendix A, "Cables and Connectors".)

2. Cycle power on the hub by unplugging the power cord and plugging it in again. As part of its power-on self-test the hub tests the console port.

3. If the test passes (the fault LED goes OFF), the console port should be functional.
   a. Remove the loopback connector and cycle power again.
   b. Connect the console cable to the hub. Press RETURN several times for the prompt.

4. If the fault LED remains ON, the hub is faulty and must be replaced.

Configuration Commands

Several of the console commands allow you to customize the operation of your hub. They are listed and described here.

Command Name	Command Function	Factory Preset Value
Backup	Configures one of the hub's ports for dedicated use in a backup (redundant) link to another hub.	No backup link configured.
IPconfig	Configures the hub to enable communication with a network management station using the Internet Protocol (IP).	IP communications disabled.
Port	Enables or disables specific hub ports.	All ports enabled.
Thinwatch	Enables or disables Thinwatch. If Thinwatch is enabled, the Fault LEDs and ThinLAN port LED will flash if the ThinLAN port becomes segmented.	Thinwatch disabled.

Note Other console commands allow you to monitor the hub's activity and to diagnose hub and network problems. See chapter 3, "Operation", for console command details.

You can also receive information about a command at the console prompt by entering HE (the Help command) followed by the first two characters of the command, for example HE PO for help on the Port command.

3

Operation

The HP Fiber-Optic Hub Plus is designed to operate unattended. A console interface is provided if you wish to customize the hub's configuration, monitor its activity, or run diagnostics. (You can also perform these and other functions with the HP network management products from a network management station anywhere on the network. See your HP network management product documentation for more information.)

Starting the Console Session

To start the console session:

1. Make sure a console is connected and configured as described in "Console Connection" in chapter 2 of this manual.

2. Press RETURN for the prompt. The console session prompt is ⇒ You may have to press RETURN several times while the hub automatically senses the terminal's communication baud rate.

The console session starts with a display like the following (the actual version numbers may be different):

```
8-port  fiber-optic  hub

HW          A.01.00
ROM         A.01.02
EEPROM   D.01.00

Enter  HE  for  help.
```

Console Commands

Enter the first two letters of a command to execute it, such as HE for the Help command. The Help command displays a screen like the following, listing all the commands:

```
8-port fiber-optic hub

Enter the first two characters to execute a command.

HElp                    - display this list of hub commands.
HElp <command>          - display detailed help for a command.
BAckup                  - configure a backup link to another hub.
COunters                - display packets, collisions, and errors.
DIsconnect              - terminate this console session.
IPconfig                - configure Internet Protocol parameters.
LOopback                - run a loopback self-test.
                             (Loopback connectors must be installed.)
PAssword                - change the network management access password.
PIng                    - perform network-layer ICMP Echo Request test.
POrt <port> <ON|OFF>    - enable or disable specified port.
REset                   - reset hub and run power-on self-test.
SPeed <new speed>       - change the console baud rate to
                             300, 1200, 2400, or 9600.
STatus                  - display port status.
TEstlink                - perform data-link layer communication test.
THinwatch <ON|OFF>      - enable or disable Thinwatch.

=>
```

The commands and their uses are described in the rest of the chapter.

HElp

To see a list and brief description of all available commands.

HElp <command>

To see the syntax and description of a specific console command. For the <command> parameter, use the first two letters of the command you wish to see.

Example: HE ST (This displays help for the Status command.)

BAckup

To configure one of the hub's ports for dedicated use in a backup (redundant) link to another hub.

The HP Fiber-optic Hub Plus allows you to use two of its network ports for a link to another hub in your network. The backup link normally carries no traffic, but it is automatically activated if the primary link fails. *Note that any of the ports can be the backup port to any other port.*

When you enter the Backup command, you are prompted for these values:

Backup Port	The port used for the backup link. Enter the port ID (see the Port command description for the port IDs). Or, enter 0 if you wish to remove an existing backup link configuration.
Primary Port	The port used for the primary link. Enter the port ID.
Remote Station Address	The 12-digit hexadecimal station address of the hub at the remote end of the critical link.
Seconds Between Test Packets	How often you want the hub to send an IEEE 802.2 Test packet to the remote hub over the primary link.
Consecutive Failures	The number of consecutive Test packet response failures that will trigger activation of the backup link. For example, enter 5 to activate the backup link on the fifth failure.

The hub monitors the primary link by sending IEEE 802.2 Test packets at the specified frequency to the specified remote hub. If "n" consecutive Response packets are not returned from the remote hub, the primary port is disabled and the backup port is enabled.

When the primary link is repaired, you must reenable the primary port. It is not automatically reenabled. When the primary port is enabled, the backup port is disabled automatically and returned to backup mode. See "Reactivating the Primary Link" in appendix E, "Backup Links".

See appendix E for more information on backup links, including requirements, limitations, and sample topologies.

COunters

To display counters for each port, the global count for all ports, and the time elapsed since they were last reset with the Reset command.

Total Packets	The total number of packets and fragments received.
Collisions	The number of times the port was involved in a collision. A single collision will be counted by all ports involved, so the total collision count may be less than the sum of the port counts.
CRC Errors	The number of packets with invalid Cyclic Redundancy Checksums (CRCs). (The CRC is a calculated value used to check the validity of each packet.)
Alignment Errors	The number of incorrectly aligned packets.
Giant Packets	The number of packets larger than 1518 bytes.
Broadcast Packets	The number of packets addressed to station address FFFFFF-FFFFFF.

Note that counter values may be approximate under heavy network traffic consisting of small packets. For the error counters, depending on the type of error, the number of the associated port may not be known. In this situation, the error is recorded in the global count only.

DIsconnect

To terminate the console session and reset the console port baud rate to be automatically sensed. The command also disconnects the phone link if you accessed the console using modems.

IPconfig

To set IP configuration parameters on the hub. Use this command if you wish the hub to be accessible using IP (the Internet Protocol). If either of the following is true, you must set the IP configuration parameters on the hub:

- The hub will be managed remotely with a network management product, such as HP OpenView Hub Manager or HP OpenView Interconnect Manager, over an IP network (a network operating system that uses IP communications).
- The network cable segments attached to the hub will be tested using the IP "Ping" test.

Note Novell NetWare uses the IPX protocol. If you are using the hub on a Novell NetWare network, no configuration of the hub is required for it to communicate with a network management station that is also using the IPX protocol. IPX is automatically enabled on the hub. The hub determines its IPX address automatically from information received from a router or file server that is running IPX on the network, and from its own station address (also sometimes called the MAC address, physical address, or Ethernet address).

See appendix D, "Network Addressing" for more information.

At the console interface prompt, enter IP and you will be prompted to enter values for the parameters listed on the next page.

IP Address	The IP address of the hub, written in the format X.X.X.X. Each number between the decimal points is a decimal number between 0 and 255. Every IP address on a network must be unique. The default is 0.0.0.0, which disables IP communications on the hub.
Subnet Mask	The bit mask defining which portion of the IP address is the subnet address, written in the format X.X.X.X. A default value is automatically generated and depends on the class of IP address that has been entered. See your network administrator for the subnet mask used by all devices on your IP network.
Primary Default Router	The IP address of the nearest IP router in your network. The default value is 0.0.0.0. If no IP routers are in your network, enter the address of a network management station, if any.
Backup Default Router	The IP address of the router used in place of the primary default router when it is inaccessible. The default value is 0.0.0.0. If there is no backup router, or no primary default router, use 0.0.0.0.
Time To Live	The number of IP routers a packet is allowed to cross before the packet is discarded. The default value is 32. Increase this value if the hub will be sending IP packets to a destination that is more than 32 routers away. The maximum is 255.

See your network administrator for these IP settings. See appendix D for information on setting the IP address.

At the end of the process of changing the IP configuration, the hub will be reset. This terminates the console session (and disconnects the phone line if using a modem) and resets the console port baud rate to be automatically sensed. To restart the session, when the reset process completes, press RETURN several times for the prompt.

LOopback

To run a loopback test on one or more hub ports:

1. Before entering this command, attach a loopback connector to each port that you want to test. For each ThinLAN port, attach a BNC "T" connector with two terminators. For the AUI port, attach an AUI loopback connector.

2. Enter LO at the console prompt. If "Fail" appears on the console for any port with a properly installed loopback connector, then the hub may be faulty and may require replacement. See chapter 4, "Troubleshooting" for more tests that can be run on the hub.

For loopback connector ordering information, see appendix A, "Cables and Connectors".

Note **Testing a Transceiver:**

The Loopback command can be used to test a transceiver attached to the hub's AUI port. Follow the procedures under "To verify a transceiver used on the AUI port" in chapter 4, "Troubleshooting".

PAssword

To set or change the password on the hub. The password is used to prevent unauthorized access of the hub from network management stations. The hub is initially shipped without a password. Follow the prompts to enter a new password or to change the existing password. You can use this command if you forget the password. To remove an assigned password, enter the command, then press RETURN without entering any characters at the password prompt.

PIng

To run a test of the path between the hub and another device that responds to IP packets. The hub sends Internet Control Message Protocol (ICMP) Echo Request packets to another node with the specified IP address and waits for Echo Response packets in return.

When you run the Ping command, you will be prompted for:

- the IP address of the destination device (in the format X.X.X.X)
- the number of packets to send
- the timeout value (the number of seconds to wait for a response).

If any errors are reported during this test, there may be a fault on the path used during the test or on the destination device. For more information about testing network links, see chapter 4, "Troubleshooting".

POrt <port> <ON/OFF>

To enable (set to ON) or disable (set to OFF) a hub port. The initial setting for all ports is enabled. *To simplify network changes, unused ports need not be disabled.* You can use the Status command to check all the ports. The <port> parameter can be:

- a fiber-optic port number from 1 to 8
- AUI or AU for the AUI port
- THINLAN or TH for the ThinLAN port
- ALL or AL (for all ports)

Example: PO 1 OFF (This disables port 1.)

REset

To run a hub self-test and reset the hub. This command also resets all the network statistic counters, and the time since last reset to 0 (see the Counters command). The current configuration is unchanged. The hub is not accessible from network management software while it is being tested, but it continues to repeat data. If the hub is faulty, the Fault LED will stay on. This command also terminates the console session (and disconnects the phone line if using a modem) and resets the console port baud rate to be automatically sensed. To restart the console session, reestablish the phone link (if used), then press RETURN several times for the prompt.

SPeed <new speed>

To change the console port baud rate. Normally, the baud rate is automatically sensed. Use this command to set the baud rate explicitly to 300, 1200, 2400, or 9600. You will be prompted to set the terminal's baud rate to the same speed and to press RETURN several times for the prompt.

STatus

To display status information for the hub, including the time elapsed since the last reset (see the Reset command), the hub's station address, the Thinwatch setting, and a table with the following port information:

Port	The port ID. (BKUP) indicates the port is configured as the backup link, (PRI) indicates the port is the primary link.
Port Status	The status of each port: ON means the port is enabled and is not auto-segmented. OFF means the port has been explicitly disabled. SEGMENTED means the port has been auto-segmented. (See "Auto-Segmentation" in chapter 1.)
Light Status	The light status of each fiber-optic port: OK means light is being received, so the fiber-optic cabling is working properly. LOW means little or no light is being received, indicating a cabling problem. Check the fiber-optic cabling and connections at both ends. (Also, see chapter 4, "Troubleshooting".)
Station Address	The station address of the device connected to each port, or: NONE meaning an address has not yet been detected. A device must transmit packets to be detected. MULTIPLE meaning more than one address has been detected.

TEstlink

To run a test of the link between the hub and another IEEE 802.3 device.

Note The destination device must be able to send an IEEE 802.2 Test response packet upon receipt of an IEEE 802.2 Test command packet.

You will be prompted for the 12-digit hexadecimal station address (also called MAC address, Ethernet address, or physical address) of the destination device. You will then be prompted for the number of test packets to send.

If any errors are reported during this test, there may be a fault on the link being tested or on the destination device. For more information about testing network links, see chapter 4, "Troubleshooting".

THinwatch <ON/OFF>

To enable (set to ON) or disable (set to OFF) Thinwatch on the ThinLAN port. With Thinwatch enabled, the Fault and ThinLAN port LEDs will flash whenever the ThinLAN port is auto-segmented. (If you don't enable Thinwatch, the LEDs won't flash.)

Auto-segmentation occurs on the ThinLAN port when it is enabled but has no connector on it, the connected segment is not properly terminated, or it experiences excessive collisions. *Segmentation of the AUI port is always displayed on the corresponding port LED and the Fault LEDs.* See "Auto-Segmentation" in chapter 1.

The default setting is disabled to allow you to "bench test" the hub and not get a fault indication. Enabled Thinwatch if the ThinLAN port is being used; disable Thinwatch if it is not being used.

Example: `TH ON` (This enables Thinwatch.)

4

Troubleshooting

Some of the hub console commands are used for the troubleshooting instructions in this chapter. See “Console Connection” in chapter 2 for details on connecting to the console port. See chapter 3, “Operation”, for details on the console commands.

This chapter describes these topics:

- basic troubleshooting tips
- diagnosing with the LEDs
- diagnostic tests:
  - testing the hub only
  - testing the hub’s ports
  - testing the links
  - testing fiber-optic cabling

Basic Troubleshooting Tips

- Make sure that you have a valid network topology. If you have trouble after a recent change to the network, switch back to the previous topology. If you no longer have trouble, the new topology is probably at fault. Topology faults may be due to excessive cable lengths or excessive repeater delays between nodes. For configuration guidelines, see the *HP EtherTwist Technical Reference Guide* (p/n 5091-3237E).

- Make sure that the hub is plugged in and that cable connections are secure.

- Make sure that “transmit” and “receive” fibers are correctly connected to the “Tx” and “Rx” receptacles. Try switching them if the Port LED is OFF or FLASHING.

Basic Troubleshooting Tips (continued)

- Make sure that fiber-optic cables are of the correct type: 62.5/125 µm or 50/125 µm.
- If the ThinLAN port is being used, make sure that the port is properly terminated. See "ThinLAN Port Connection" in chapter 2.
- If the ThinLAN port is not being used, make sure that Thinwatch is disabled. (If Thinwatch is enabled on an unused ThinLAN port, the hub will operate but the Fault LED will flash.) Use the console's Thinwatch command.
- If a transceiver is connected to the AUI port of the hub, make sure its switches are correctly set according to its instructions. Make sure the SQE test is disabled.
- If the console port does not work, see "Console Connection" in chapter 2.
- If you are using IP communications, make sure that your IP configuration parameters are correctly set. Use the console's IPconfig command.
- Check LEDs. For descriptions, see "Back of the Hub" in chapter 1. When power is cycled, all LEDs should go ON momentarily and then go into their normal operational states. If all the LEDs do not go ON, an LED may be burned out, or the hub is faulty and must be replaced. Whenever you suspect a burned-out LED, cycle power by unplugging the hub and then plugging it in; then check the LEDs immediately. When the hub is operating, LED patterns that indicate a hub or network problem are shown in the table on the next page.

Diagnosing With the LEDs

LED patterns indicating problems				Diagnostic Tips
Power	**Col**	**Fault**	**Port**	^
OFF	*	*	*	Check power cord and power source. If OK, replace the hub.
*	Very frequent, or solidly ON	*	*	Very frequent collisions could indicate a network fault, a cable not properly terminated, or SQE test not disabled.
*	*	ON	*	A hub hardware failure was detected during self-test. Replace the hub.
*	*	Flashing	Flashing	A port has been auto-segmented because of too many collisions or a ThinLAN port not properly terminated or not connected. Check cable terminations, connections, SQE Test setting, transceivers, and attached network devices.
*	*	OFF	OFF or flashing intermit-tently on a port in use	Check cabling on the port indicated. For a fiber-optic port, also check for correct Tx and Rx connections. Try switching them. Use the Status console command to check if: – The port has been manually turned off. In this case, turn the port back on. – The port has LOW light status. In this case, check light status on the device at the other end of the fiber-optic link; if it is LOW, the link is broken.
* This LED is not important for the diagnosis.				

Diagnostic Tests

Testing the Hub Only

Use one of the following tests of the hub's internal circuitry. The first is the most complete internal test. (None of these tests the hub's ports; see the next section for port tests.)

- Cycle power on the hub by unplugging the power cord and then plugging it in. This causes the hub to test itself. All LEDs should go ON momentarily before returning to their operational states. If all the LEDs do not go ON, an LED may be burned out, or the hub is faulty. If the Fault LED on the front or back of the hub stays ON, the hub is faulty. In either case, replace the hub.

- Connect a console to the hub. Use the console's Reset command, which causes the hub to test itself. All LEDs should go ON momentarily before returning to their operational states. If all the LEDs do not go ON, an LED may be burned out, or the hub is faulty. If the Fault LED on the front or back of the hub stays ON, the hub is faulty. In either case, replace the hub. See chapter 3, "Operation", for console command details.

- Use an HP network management product to run a self-test. For instructions, see the network management product's documentation.

Testing the Hub's Ports

The tests described on the next page require a loopback connector for each port being tested. Ports without loopback connectors will fail the test. For loopback connector illustrations and part numbers see "Loopback Connectors" in appendix A.

To verify one or more of the fiber-optic ports, AUI port, or ThinLAN port:

1. Attach a loopback connector to each port being tested. For a fiber-optic port, attach a Fiber-Optic Loopback Cable to its Tx and Rx receptacles. (If you have too few Fiber-Optic Loopback Cables for ports to test, then you can repeat this procedure as necessary to test all the ports.) For an AUI port, attach an AUI loopback connector. For a ThinLAN port, attach a BNC "T" connector with two terminators. *Make sure all connectors are securely attached. An improperly attached loopback connector can cause a false failure indication.*

2. Connect the console. See "Console Connection" in chapter 2.

3. Run the Loopback command. See details in chapter 3, "Operation". If a port with a loopback connector fails the test, the hub is faulty and must be replaced.

To verify the hub's console port:

Perform the steps in the "Test Console Port Procedure" under "Console Connection" in chapter 2.

To verify a transceiver used on the AUI port:

1. Make sure the transceiver can be used in a loopback test. Some transceivers have a switch that can be used to put them in a loopback mode.

2. Make sure the transceiver is receiving power from the device to which it is attached.

3. Attach a loopback connector to the transceiver that is attached to the hub's AUI port. The loopback connector you use depends on the type of transceiver you are using (twisted-pair, thin LAN, fiber-optic, etc.).

4. Connect the console. See "Console Connection" in chapter 2.

5. Run the Loopback command. See details in chapter 3, "Operation". If the AUI port is reported to "Pass", the transceiver is OK and this procedure is finished. If the AUI port is reported to "Fail", then go on to the next step. In either case, set the transceiver's loopback switch back to the position for normal operation.

6. Disconnect the transceiver from the hub. Attach an AUI loopback connector directly to the hub's AUI port. Run the Loopback command again. If the AUI port is reported to "Pass", the transceiver is probably faulty. If the AUI port is reported to "Fail", the hub is faulty and must be replaced.

Testing the Link

Use one of the following tests between the hub and an addressable device on the network:

- Use the console's Testlink command to run a link test. This works with devices able to send an IEEE 802.2 Test Response packet upon receipt of a Test command packet. You specify the remote device by its 12-digit hexadecimal station address. See "Testlink" in chapter 3 for details.

- Use the console's Ping command to run a network-layer test. This works with devices having an IP address and able to respond to an ICMP Echo Request packet. You specify the remote device by its IP address. See "Ping" in chapter 3 for details.

- Use an HP network management product to test the link. For instructions, see the network management product's documentation.

- To test links with HP StarLAN 10 network hardware, see the *HP StarLAN 10 Hardware Troubleshooting Guide* (p/n 5959-2258).

Testing Fiber-Optic Cabling

If a fiber-optic port LED is not ON, or the Status command shows LOW light, check the physical connections of the cable segment. Use a fiber-optic power meter, such as the HP 8140A Optical Loss Test Set, to check that cable attenuation, end to end, is less than the maximum listed for your fiber in the optical specifications in chapter 1 of this manual. If the cabling is found to be OK, and the Status command continues to show LOW light, then test the ports at both ends (see "Testing the Hub's Ports" above).

A

Cables and Connectors

This appendix lists cables that have been tested and verified for use with the HP Fiber-Optic Hub Plus. The minimum pin-outs are shown, in case you wish to use an unlisted cable or manufacture your own. Note that each pin-out does not necessarily match the pin-out for the corresponding HP cable, but cables manufactured to follow the minimum pin-out will function correctly. Loopback connectors for all hub ports are also shown in this appendix.

These topics are discussed:

- HP cables
- Other standard cables
- Fiber-Optic cable requirements
- Thin LAN cable requirements
- AUI cable
- Console connector and cable pin-outs
- Loopback connectors

HP Cables

Cable Function	Cable Type	Port Type on Terminal, PC, or Modem	HP Product Number
Connecting to the network:			
Connecting the hub's fiber-optic ports to a patch panel or device with SMA connectors	ST–SMA hybrid fiber-optic cable	—	5181-6181 (1 meter duplex fiber-optic cable)
Connecting hub-to-hub in a rack	IEEE Type 10Base2 Thin coaxial cable	—	92214U (0.5 meter), including BNC "T" connector
Connecting a transceiver to the AUI port *	AUI cable	—	92264D (1 meter) 92254A through H (6–48 meters) 92254J (5 meters)
Connecting to the console port:			
Connect a terminal or PC to the console port	RS-232-C "Crossover" cable	25-pin female	13242G†, 40242G†
		25-pin male	13242H
		9-pin male	24542G†
		9-pin female (for HP 110)	92221P†
Connect a modem to the console port	"Straight-through" RS-232-C modem cable	25-pin female	13242M, 13242N, 17355M
		25-pin male	31391A

* An AUI cable is not necessary with some transceivers such as the HP 28685A or HP 28685B EtherTwist Transceivers, the HP 28641B ThinLAN Transceiver, and the HP 28683A Fiber-Optic Transceiver. These transceivers attach directly to the AUI port of a network device.

† For these cables, the signals DTR (pin 20) and RTS (pin 4) must be on, or high, on yo
terminal or in your terminal emulator.

Other Standard Cables

Cable Function	Port Type on Terminal, PC, or Modem	Standard Cable or Cable Solution
Connecting to the console port:		
Connect a terminal or PC to the console port with an RS-232-C cable.*	25-pin female	Attach a null modem adapter† (Tandy Null Modem Adapter No. 26-1496 has been tested) to the console port. Then attach a straight-through modem cable to the null modem adapter.
	9-pin male	Use a Black Box PC/AT Serial Printer Cable (EVNBPC has been tested). **OR** Attach a null modem adapter† (Tandy Null Modem Adapter No. 26-1496 has been tested) to the console port. Then attach a modem cable† (Black Box Cable EVNBMC and Cablex PC Modem Cable have been tested) to the null modem adapter.
Connect a modem to the console port	25-pin female or male port	"Straight-through" RS-232-C modem cable (standard cable)

***** For these cables, the signals DTR (pin 20) and RTS (pin 4) must be on, or high, on your terminal or in your terminal emulation program.

† The required minimum pin-out is listed in the section, "Console Connector and Cable Pin-Outs".

Fiber-Optic Cable Requirements

Basic fiber-optic cable specifications are provided here. For more information see the *HP EtherTwist Technical Reference Guide* (HP p/n 5091-3237E).

Fiber Specifications. The HP Fiber-Optic Hub Plus supports two different fiber core and cladding sizes, 62.5/125 µm and 50/125 µm. The hub uses ST connectors.

Fiber Core/Cladding Size	62.5/125mm	50/125mm
Fiber Type	Multimode	Multimode
Attenuation Grade	® 4.0 dB/km	® 4.0 dB/km
Numerical Aperture	0.275	0.20
Modal Bandwidth	⏐ 150 MHz-km	⏐ 150 MHz-km

Note: Attenuation and modal bandwidth values are at 850nm wavelength for both fiber sizes.

Length Limit. The IEEE FOIRL (fiber-optic inter-repeater link) standard limits the length of the fiber-optic cable between two hubs to one kilometer. In most network configurations, use the 1-km length maximum as a rule of thumb.

Thin LAN Cable Requirements

The thin coaxial cables used with the HP Fiber-Optic Hub Plus' ThinLAN port must comply with the IEEE 802.3 Type 10Base2 requirements. Some RG-58 A/U or RG-58 C/U cable meet these requirements.

The maximum length of a single thin coaxial cable segment is 185 meters.

AUI Cable

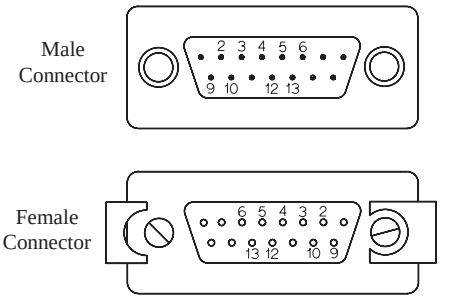
Minimum Pin-Out

Transceiver end 15-pin female	Hub end 15-pin male	Signal
2	2	Control In circuit A
3	3	Data Out circuit A
4	4	Data In circuit Shield (common drain)
5	5	Data In circuit A
6	6	Voltage Common
9	9	Control In circuit B
10	10	Data Out circuit B
12	12	Data In circuit B
13	13	Voltage Plus

For this connection, you can use:

- HP 92264D (1-meter thin AUI extension, pin 4 not connected)
- HP 92254A through H (6-meter through 48-meter thick AUI cables)
- HP 92254J (5-meter thin AUI cable, pin 4 not connected)

Some longer cables may have all 15 pins wired. See the IEEE 802.3 standards document for definitions of the pins not shown here.



Console Connector and Cable Pin-Outs

The HP Fiber-Optic Hub Plus has a console port that automatically detects whether a terminal or a modem is connected. No switch setting is required. Because of this function, a standard "straight-through" cable can not be used when connecting a terminal directly.

For a terminal connection, you use a "crossover" cable (essentially a cable for connecting a printer to a serial port), or a modem cable with a null modem adapter attached (which provides the crossover function). For a modem connection, you can use a standard modem cable.

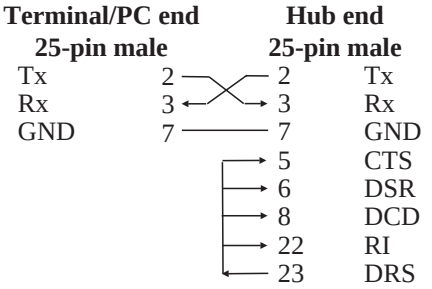
This section provides pin assignment information for the cables you can use on the hub's console port.

Pin-Out for Hub's Console Port Connector

PIN	US	CCITT	DIN
1	CHS GND	101	
2	Tx	103	D1
3	Rx	104	D2
4	RTS	105	S2
5	CTS	106	M2
6	DSR	107	M1
7	GND	102	
8	CD	109	M5
20	DTR	108	S1
22	RI	125	M3
23	SR	111	

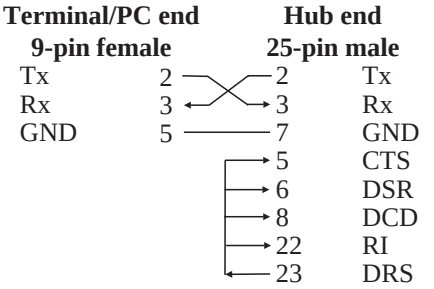
RS-232-C “Crossover” Cable (for Terminal/PC with 25-Pin Connector)

Minimum Pin-Out



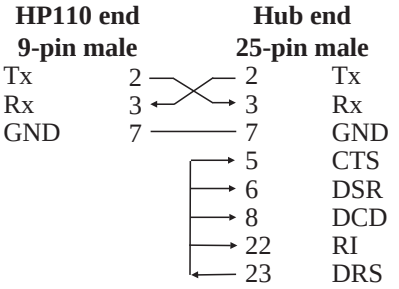
RS-232-C “Crossover” Cable (for Terminal/PC with 9-Pin Connector)

Minimum Pin-Out



RS-232-C Cable for HP 110

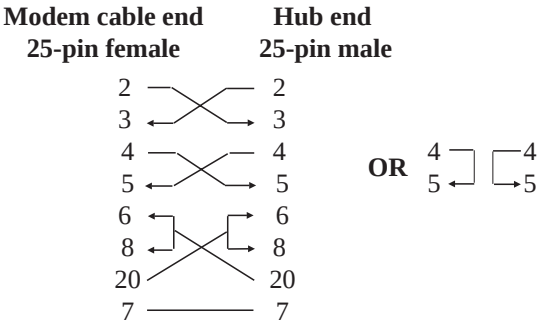
Minimum Pin-Out



Null-Modem Adapter

(use with a modem cable when connecting a terminal)

Minimum Pin-Out



DTR (pin 20) and RTS (pin 4) must be on, or high, on your terminal or in your terminal emulation program.

RS-232-C Modem Cable

Minimum Pin-Out

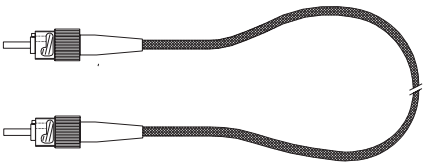
Modem end 25-pin male		Hub end 25-pin male	Signal
2	←	2	Tx
3	→	3	Rx
4	←	4	RTS
5	→	5	CTS
6	→	6	DSR
7	—	7	GND
8	→	8	CD OR DCD
20	←	20	DTR
22	→	22	RI
23	←	23	DRS – typically on V.24 (European) modems

Loopback Connectors

The four loopback connectors shown below are useful for troubleshooting your HP Fiber-Optic Hub Plus. The connectors for the AUI, ThinLAN, and console ports are included in the HP Extended LAN Troubleshooting Kit, product number HP 28689B, or all four can be purchased separately. Contact your HP-authorized LAN dealer or your local HP sales office for assistance.

For Fiber-Optic Ports

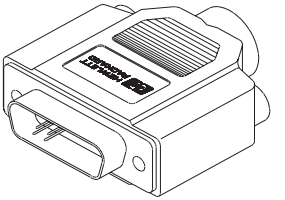
HP Fiber-Optic Loopback Cable.
HP part number 5041-3738.



For AUI Port

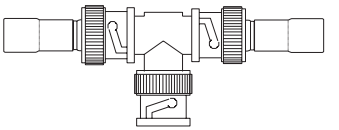
HP part number 28663-63001.
The following pins are connected:

- pin 3 to pin 5
- pin 10 to pin 12



For ThinLAN Port

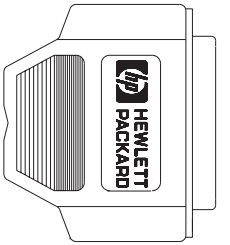
HP part number 5061-4990.
BNC "T" with two 50-ohm terminators attached.



For Console Port

HP part number 5062-3355.
The following pins are connected:

- pin 2 to pin 3
- pin 4 to pin 5 to pin 8
- pin 6 to pin 20 to pin 22
- pin 7 to pin 23



B

Specifications

Physical

Dimensions:	42.5 cm by 23.5 cm by 4.4 cm (16.8 in by 9.3 in by 1.7 in)
Weight:	2.7 kg (6.0 lb)

Electrical

(The HP Fiber-Optic Hub Plus automatically adjusts to any voltage between 90 and 240 volts and any frequency between 50 and 60 Hz.)

ac voltage:	100–120 volts	200–240 volts
Maximum current:	0.8 amps	0.6 amps
Frequency range:	50/60 Hz	50/60 Hz

Environmental

	Operating	**Non-Operating**
Temperature:	0°C to 55°C (32°F to 131°F)	–40°C to 70°C (–40°F to 158°F)
Relative humidity: (non-condensing)	15% to 95% at 40°C (104°F)	15% to 90% at 65°C (149°F)
Maximum altitude:	4.6 km (15,000 ft)	4.6 km (15,000 ft)

Cable Interfaces

- The 16 fiber-optic connectors are ST type and are designed to support 62.5/125 µm or 50/125 µm fiber.
- The ThinLAN ports are compatible with the IEEE 802.3 Type 10Base2 standard.
- The AUI port is compatible with IEEE 802.3 standards.
- The RS-232-C console port conforms to V.22 bis.

Optical

	62.5/125 μm fiber	50/125 μm fiber
Transmitter power:	–12 dBm nominal; –17 dBm minimum	–16.5 dBm nominal; –21 dBm minimum
Receiver sensitivity:	–30 dBm nominal; –27 dBm minimum	–30 dBm nominal; –27 dBm minimum
Power budget:	10 dB	6 dB
Wavelength:	820 nm	820 nm

Electromagnetic

Emissions

*FCC part 15 Class A	(in US, Canada, and Latin America)
CISPR-22 Class A	
*EN 55022 Class A	(in Europe)
*VCCI Class 1	(in Japan)

Immunity

ESD	*prEN 55101-2 (1991) / IEC 801-2 (3 kV CD, 8 kV AD) (in Europe)
Radiated Emissions	*prEN 55024-3 (1991) / IEC 801-3 (draft) (3 V/m) (in Europe)

* These specifications are legal requirements in the indicated countries.

Datacomm Declarations

United Kingdom
The HP 28682A is approved under Approval Number NS/G/1234/J/100003 for indirect connection to public telecommunications systems within the United Kingdom.

Sweden
Application and Declaration of Conformity to Swedish requirements has been filed.

Germany
Application for Certification and License approval have been filed.

C

Modem Configuration

HP 35031A Support Link II

At the hub end:	Configure SOFT OPTION 6 to 1. Configure SOFT OPTION 15 to 2. Configure SOFT OPTION 16 to 2. Configure SOFT OPTION 20 to 2. Configure SOFT OPTION 21 to 2.
At the user end:	Configure SOFT OPTION 16 to 2.

HP 50759A Support Link

At the hub end:	For an 8-position switch, set switch 4 down, all others up. For a 4-position switch, set switch 2 up, all others down.
At the user end:	For an 8-position switch, set switches 3 and 8 down, all others up. For a 4-position switch, set all switches down.

HP 37212B Support Link

At the hub end:	Set switches 8, 9, 11, and 12 up (set to 1), all others down (set to 0). AUTO ANS on the front should be pushed in.
At the user end:	Set switches 8, 9, 11, and 12 up (set to 1), all others down (set to 0).

Black Box V.32 9600 Async.

At the hub end:	Load the factory option set #1. Then make these changes: – Data Rate Menu: change to 9600 uncoded – Modem Parameters Menu: change to Forced Answer – DTE Parameters Menu: – set DTR State to Responds to DTR Change – set DSR State to DSR is Normal – set CTS State to CTS is Normal – set DCD State to DCD is Normal
At the user end:	Configure as at the hub end except: – Modem Parameters Menu: change to Normal Originate

Hayes 1200 Smartmodem (for both 8-and 10-switch units)

At the hub end:	Set all switches up.
At the user end:	Set switches 3 and 8 down, all others up.

Racal Vadic Maxell 2400 VP (Hayes 2400 Compatible)

At the hub end:	Configure with a terminal or PC using the following sequence: at&f&c1&d2&s1q1*f0&wz Depress the ANS button. The red light should go ON.
At the user end:	Configure with a terminal or PC using the following sequence: at&f&c1&d2&s1*f0&wz

D

Network Addressing

The HP Fiber-Optic Hub Plus can be managed over the network by HP network management products, and any other network management products that use the Simple Network Management Protocol (SNMP). The communication between the SNMP network management station and the hub takes place using the network layer protocols, IPX for Novell networks, or IP for TCP/IP networks.

Which protocol you use depends on the protocol being used by the network management station. Additionally, if the network management station is on the other side of a router from your hub, the protocol you run on both the hub and the network management station depends on which protocol the router can handle.

The network layer communications require that the hub have a network layer address. This appendix provides some background information on IPX and IP addressing.

IPX Addressing for Novell NetWare

The Novell NetWare network operating system uses a proprietary protocol called Internetwork Packet Exchange (IPX). The IPX protocol firmware is always available on the HP Fiber-Optic Hub Plus; it becomes active when the hub gets an IPX address. The IPX address consists of a network number and a device identification. The address is automatically assigned to the hub as follows (no IPX configuration of the hub is necessary):

- The network number is automatically assigned by a router or file server on the network that is running the IPX protocol.
- The device identification is merely the hub's station address (also known as the MAC address, Ethernet address, or physical address). This address is a unique 12-digit hexadecimal number assigned to the hub at the factory.

IPX Addressing Notes:

- Because the IPX address is assigned automatically, no IPX configuration is necessary; no IPX configuration is provided on the hub console interface. By default, the hub is ready to be managed by an SNMP network management station that is configured for IPX communications.

- If your hub is part of a network that is running IPX only, you do not need to perform the IP configuration.

IP Addresses for IP and Non-IP Networks

If you have chosen to manage your hub with an SNMP/IP network manager, your hub must be configured with an IP address. If your network will be connected with other networks that use IP addresses, you must use *assigned* IP addresses. Otherwise, you can build your own IP addressing scheme (described on the next page).

Using Assigned IP Addresses

Hewlett-Packard strongly recommends that if you intend to expand, integrate, or connect your network to other networks, you use an assigned IP address. There is a formal process to assign unique IP addresses to networks worldwide. DDN Network Information Center in Menlo Park, California, is in charge of assigning IP addresses. Contact the DDN Network Information Center by phone or mail. They will provide instructions and the necessary documents to assign and register your IP addresses.

Telephone	in U.S. only: 1-800-235-3155 worldwide: 415-859-3695
Mailing Address	Hostmaster DDN Network Information Center SRI International 333 Ravenswood Avenue Menlo Park, California 94025

Building Your Own IP Addressing Scheme

If your network is isolated and will not be connected to any other networks that use IP addressing, you can build your own IP addressing scheme. If you use your own addressing scheme, be aware that any connection to another IP network could cause communication problems on both networks. The IP addresses on the two networks must be compatible. Each address must be unique.

The following documents have detailed descriptions on how to build your own IP addressing scheme:

- *HP OpenView EtherTwist Network Management DOS Reference Guide*
  HP part number 5091-3635E

- *Internetworking With TCP/IP: Principles, Protocols, and Architecture*
  Author: Douglas E. Comer
  Publisher: Prentice-Hall, Inc.

Example Addressing Scheme

On the next page is an example of a class C addressing scheme. Class C addresses allow up to 254 devices to be configured. If you have 254 or fewer devices to be managed on your network, you can use the addressing scheme shown below. If you have more than 254 devices to configure, see the referenced documents and use a class B addressing scheme. Class B allows 65534 devices to be configured.

The IP address format is X.X.X.X, where each X is an integer between 1 and 255. The integers are separated by decimal points. For a given network with its own class C addressing scheme, the first three integers of each address must be the same. The fourth integer must be unique for each addressed device. (Do not use 0 or 255 in the fourth position. They are reserved integers.)

For three hubs and an HP network management station on the network, the class C addresses might be:

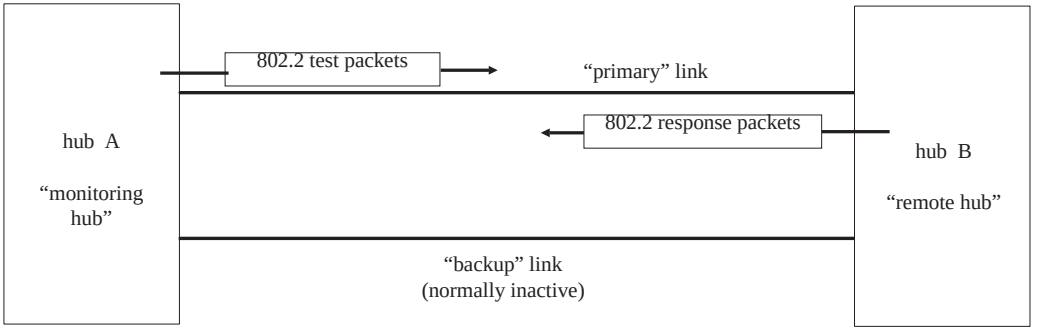
management station	192.1.1.1
first hub	192.1.1.10
second hub	192.1.1.11
third hub	192.1.1.12
…	…

See “IPconfig” in chapter 3 for the IP configuration procedures and descriptions of the parameters.

Backup Links

Description

In some network configurations a critical link exists, for example between two workgroups that regularly share or exchange data over the network. To maintain the integrity of such a critical link, the HP Fiber-Optic Hub Plus offers a backup link feature. A backup link is a separate cable run between two hubs that is automatically enabled if the connection designated as the primary link fails.



The hub on which the redundant link is configured (hub A in the illustration), is responsible for monitoring the link. It sends IEEE 802.2 Test packets to the remote hub (hub B in the illustration) and looks for response packets from that hub. If the response packets fail to come back, the primary link is considered as having failed and the backup link, which had not been carrying any traffic, is enabled automatically. If the primary link does fail, it is automatically disabled until it can be repaired and reenabled.

When the primary link is repaired, you must reenable the primary port. It is not reenabled automatically. When the primary port is enabled, the backup port is automatically disabled and returned to backup mode. See "Reactivating the Primary Link" later in this appendix.

Limitations

- Each hub can monitor a single backup link (only one backup link can be configured on each hub). But, the hub may be at the remote end of one backup link and at the monitoring end of a backup link to a different hub.

- A given hub should be connected to the remote end of no more than two backup links. If it is functioning as the remote hub in more than two backup links, it may not be able to respond to the test packets fast enough when there is a high level of data traffic on the network segments.

  This limit may be exceeded by increasing the time between test packet transmissions on the monitoring hubs. For *all* the backup links in which the remote hub is involved, the time configured on the monitoring hubs for those links should be increased by one second for each additional backup link beyond two links. Add one to this count if the remote hub is also functioning as a primary hub in a different link.

Additional Notes

- Any port on the hub can be used for either the primary link or the backup link.

- Any combination of cable types can be used. For example, a thin coax link can act as a backup link to a fiber-optic link. See “Sample Topologies” later in this appendix. Note that there are some differences between cable types, for example segment length limitations, that will prevent one type from being used to backup another type in some network topologies.

- The primary link and the backup link cabling should be run over different paths (through different conduits, for example) to reduce the possibility that damage will occur to both cables simultaneously.

Configuring A Backup Link

Configure the Monitoring Hub Only. All configuration of the backup link is performed from the console on the hub that is responsible for monitoring the backup link. On the remote hub, you only need to make sure the ports used in the primary and backup links are both enabled.

Use the Console's Backup Command. To configure this link, you use the Backup command on the hub console interface. The command prompts you to identify the port used for the backup link, the port used for the primary link, the station address of the hub at the remote end of the link, how frequently (in seconds) test packets (used to check the status of the primary link) should be sent to the remote hub, and how many consecutive response failures will trigger activation of the backup link. The Backup command is described in more detail in chapter 3, "Operation" under the section "Console Commands".

Follow this Configuration/Installation Sequence. If a hub is installed in a network that includes two connections to another hub, until one of the connections can be configured as a backup link, a loop in the network exists causing some network performance degradation. For this reason, it is better to configure the backup link on the hub before the hub is installed in the network. It is best to follow these steps:

1. Attach a console to the hub's console port and start a console session. (For instructions see step 4, "Customize the hub's configuration" in chapter 2.)

2. Use the Backup command (BA) to complete the backup link configuration. (See the Backup command description in chapter 3, or enter HE BA at the console prompt for online help on the Backup command.)

3. Complete the network cable connections between the monitoring hub and the remote hub. (For instructions, see "Port Connections" in chapter 2.)

4. Enable the primary port with the Port command (enter PO n ON where n is the primary port's ID). This step is necessary because, without the cables connected, the test packets cannot be successfully sent and the backup port is activated. Once you enable the primary port, it assumes the active role.

Note On the remote hub, make sure that the ports connected to both the primary and backup links are enabled (PO n ON). On the monitoring hub, the status of the primary and backup ports is controlled by the hub's firmware; you do not need to explicitly enable the monitoring hub's ports.

Identifying the Backup Link

The ports designated as the primary and backup ports are identified on the hub console's Status command screen by the words (PRI) and (BKUP), respectively, next to the port numbers. HP network management products can also be used to identify the backup link. See the HP network management product's documentation for more information.

Indications of Backup Link Activation

When the primary link fails ("n" consecutive test packet responses were not received on the primary port from the other hub), the backup link is automatically enabled. The effect of this change is displayed on the monitoring hub's LEDs and console interface. Activation of the backup link does not cause any changes to the status of any of the ports on the remote hub.

On the hub's LEDs, the primary port LED goes off, and the backup port LED goes on.

On the hub console's Status command screen, the status of the primary port changes from ON to OFF, and the backup port changes from OFF to ON.

On HP network management products: Depending on the HP network management product you have, you may be able to automatically monitor the status of the backup link from the network management station. See your HP network management product documentation for more information.

Reactivating the Primary Link

When the primary link is repaired, you can use any of the following methods to reenable the primary port:

- From the hub's console, use the Port command, PO n ON where n i s the primary port's ID.
- Cycle power on the hub. This is useful if you do not have access to the hub's console interface, for example, because the hub is in a wiring closet and a console is not connected.
- From an HP network management station, reenable the port or reset the hub. See the network management product documentation for details on how to enable a port or reset the hub.

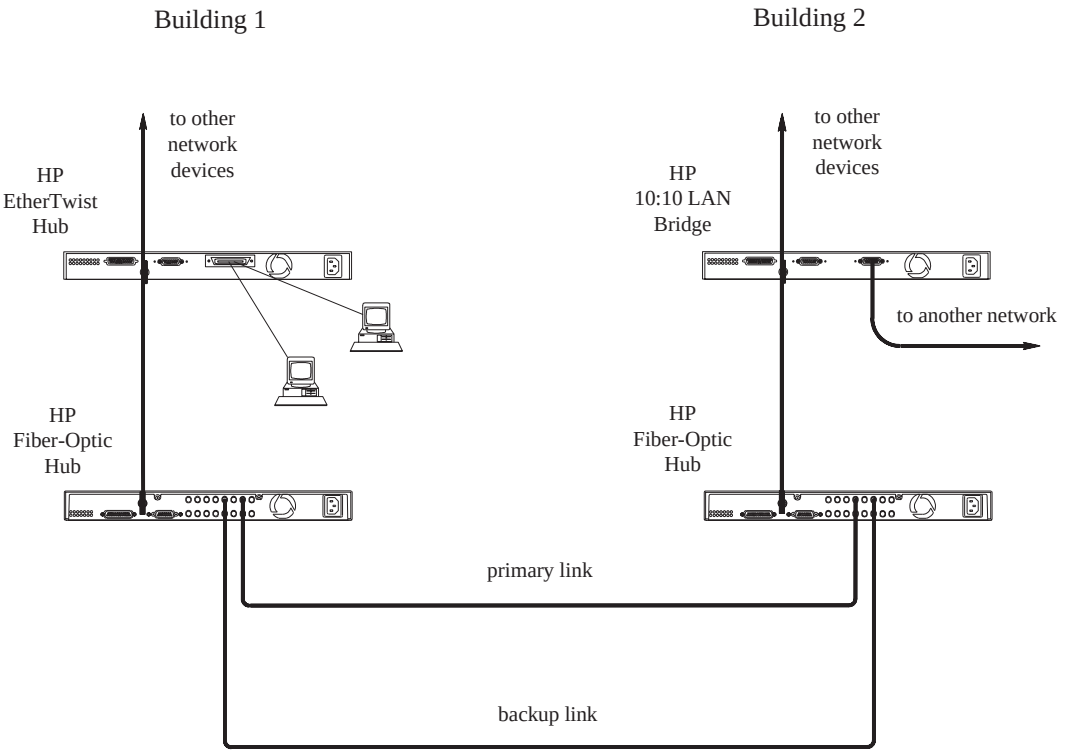
When the primary port is reenabled, the backup port is automatically disabled and returned to backup mode.

Sample Topologies

Following are two simple sample topologies that may give you some ideas on how a backup link could be used in your network.

Sample 1: Fiber-Optic Hub-to-Fiber-Optic Hub

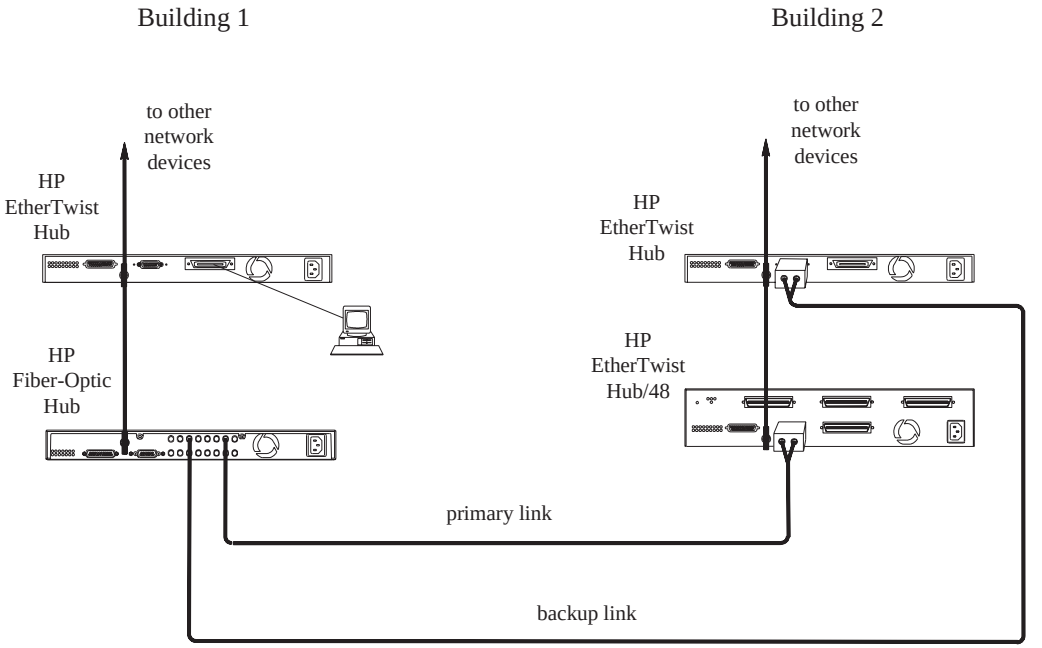
In this sample topology, the primary and backup links consist of fiber-optic cable segments between two HP Fiber-Optic Hub Pluses.



Sample 2: Redundant Fiber-Optic Links Using a Single Fiber-Optic Hub

In this topology, redundant fiber-optic links are provided between a single HP Fiber-Optic Hub Plus and an HP EtherTwist Hub Plus/48. The primary link consists of a fiber-optic cable from the fiber-optic hub to an HP Fiber-Optic Transceiver on the Hub Plus/48. The backup link consists of two cable segments, a fiber-optic segment from the fiber-optic hub to an HP Fiber-Optic Transceiver on an HP EtherTwist Hub Plus, and a thin LAN cable from the Hub Plus to the Hub Plus/48. Because the Hub Plus repeats all the signals it receives, it can be considered as just a connector in the backup link.

The backup link configuration would be performed on the fiber-optic hub with address of the Hub Plus/48 used for the Remote Station Address configuration parameter.



Safety Information

Safety Symbols

Documentation reference symbol. If the product is marked with this symbol, refer to the product documentation to get more information about the product.

WARNING A WARNING in the manual denotes a hazard that can cause injury or death.

CAUTION A CAUTION in the manual denotes a hazard that can damage equipment.

Do not proceed beyond a WARNING or CAUTION notice until you have understood the hazardous conditions and have taken appropriate steps.

Grounding

This is a safety class I product and has a protective earthing terminal. There must be an uninterruptible safety earth ground from the main power source to the product's input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, disconnect the power cord until the ground has been restored.

For LAN cable grounding:

- If your LAN covers an area served by more than one power distribution system, be sure their safety grounds are securely interconnected.
- LAN cables may occasionally be subject to hazardous transient voltages (such as lightning or disturbances in the electrical utilities power grid). Handle exposed metal components of the network with caution.

Servicing

There are no user-serviceable parts inside this product. Any servicing, adjustment, maintenance, or repair must be performed only by service-trained personnel.

This product does not have a power switch; it is powered on when the power cord is plugged in.

Informations concernant la sécurité

Symboles de sécurité

Symbole de référence à la documentation. Si le produit est marqué de ce symbole, reportez-vous à la documentation du produit afin d'obtenir des informations plus détaillées.

AVERTISSEMENT Dans la documentation, un AVERTISSEMENT indique un danger susceptible d'entraîner des dommages corporels ou la mort.

ATTENTION Un texte de mise en garde intitulé ATTENTION indique un danger susceptible de causer des dommages à l'équipement.

Ne continuez pas au-delà d'une rubrique AVERTISSEMENT ou ATTENTION avant d'avoir bien compris les conditions présentant un danger et pris les mesures appropriées.

Cet appareil est un produit de classe I et possède une borne de mise à la terre. La source d'alimentation principale doit être munie d'une prise de terre de sécurité installée aux bornes du câblage d'entrée, sur le cordon d'alimentation ou le cordon de raccordement fourni avec le produit. Lorsque cette protection semble avoir été endommagée, débrancher le cordon d'alimentation jusqu'à ce que la mise à la terre ait été réparée.

Mise à la terre du câble de réseau local:

- si votre réseau local s'étend sur une zone desservie par plus d'un système de distribution de puissance, assurez-vous que les prises de terre de sécurité soient convenablement interconnectées.
- Les câbles de réseaux locaux peuvent occasionnellement être soumis à des surtensions transitoires dangereuses (telles que la foudre ou des perturbations dans le réseau d'alimentation public). Manipulez les composants métalliques du réseau avec précautions.

Aucune pièce contenue à l'intérieur de ce produit ne peut être réparée par l'utilisateur. Tout dépannage, réglage, entretien ou réparation devra être confié exclusivement à un personnel qualifié.

Cet appareil ne comporte pas de commutateur principal ; la mise sous tension est effectuée par branchement du cordon d'alimentation.

Hinweise zur Sicherheit

Sicherheitssymbole

Symbol für Dokumentationsverweis. Wenn das Produkt mit diesem Symbol markiert ist, schlagen Sie bitte in der Produktdokumentation nach, um mehr Informationen über das Produkt zu erhalten.

VORSICHT Eine VORSICHT in der Dokumentation symbolisiert eine Gefahr, die Verletzungen oder sogar Todesfälle verursachen kann.

ACHTUNG ACHTUNG in der Dokumentation symbolisiert eine Gefahr, die das Gerät beschädigen kann.

Fahren Sie nach dem Hinweis VORSICHT oder ACHTUNG erst fort, nachdem Sie den Gefahrenzustand verstanden und die entsprechenden Maßnahmen ergriffen haben.

Dies ist ein Gerät der Sicherheitsklasse I und verfügt über einen schützenden Erdungsterminal. Der Betrieb des Geräts erfordert eine ununterbrochene Sicherheitserdung von der Hauptstromquelle zu den Geräteingabeterminals, den Netzkabeln oder dem mit Strom belieferten Netzkabelsatz voraus. Sobald Grund zur Annahme besteht, daß der Schutz beeinträchtigt worden ist, das Netzkabel aus der Wandsteckdose herausziehen, bis die Erdung wiederhergestellt ist.

Für LAN-Kabelerdung:

- Wenn Ihr LAN ein Gebiet umfaßt, das von mehr als einem Stromverteilungssystem beliefert wird, müssen Sie sich vergewissern, daß die Sicherheitserdungen fest untereinander verbunden sind.
- LAN-Kabel können gelegentlich gefährlichen Übergangsspannungen ausgesetzt werden (beispielsweise durch Blitz oder Störungen in dem Starkstromnetz des Elektrizitätswerks). Bei der Handhabung exponierter Metallbestandteile des Netzwerkes Vorsicht walten lassen.

Dieses Gerät enthält innen keine durch den Benutzer zu wartenden Teile. Wartungs-, Anpassungs-, Instandhaltungs- oder Reparaturarbeiten dürfen nur von geschultem Bedienungspersonal durchgeführt werden.

Dieses Gerät hat keinen Netzschalter; es wird beim Anschließen des Netzkabels eingeschaltet.

Considerazioni sulla sicurezza

Simboli di sicurezza

Simbolo di riferimento alla documentazione. Se il prodotto è contrassegnato da questo simbolo, fare riferimento alla documentazione sul prodotto per ulteriori informazioni su di esso.

PERICOLO La dicitura PERICOLO denota un pericolo che può causare lesioni o morte.

ATTENZIONE La dicitura ATTENZIONE denota un pericolo che può danneggiare le attrezzature.

Non procedere oltre un avviso di PERICOLO o di ATTENZIONE prima di aver compreso le condizioni di rischio e aver provveduto alle misure del caso.

Questo prodotto è omologato nella classe di sicurezza I ed ha un terminale protettivo di collegamento a terra. Dev'essere installato un collegamento a terra di sicurezza, non interrompibile che vada dalla fonte d'alimentazione principale ai terminali d'entrata, al cavo d'alimentazione oppure al set cavo d'alimentazione fornito con il prodotto. Ogniqualvolta vi sia probabilità di danneggiamento della protezione, disinserite il cavo d'alimentazione fino a quando il collegamento a terra non sia stato ripristinato.

Per la messa a terra dei cavi LAN:

- se la vostra LAN copre un'area servita da più di un sistema di distribuzione elettrica, accertatevi che i collegamenti a terra di sicurezza siano ben collegati fra loro;
- i cavi LAN possono occasionalmente andare soggetti a pericolose tensioni transitorie (ad esempio, provocate da lampi o disturbi nella griglia d'alimentazione della società elettrica); siate cauti nel toccare parti esposte in metallo della rete.

Nessun componente di questo prodotto può essere riparato dall'utente. Qualsiasi lavoro di riparazione, messa a punto, manutenzione o assistenza va effettuato esclusivamente da personale specializzato.

Questo apparato non possiede un commutatore principale; si mette scotto tensione all'inserirsi il cavo d'alimentazione.

Consideraciones sobre seguridad

Símbolos de seguridad

Símbolo de referencia a la documentación. Si el producto va marcado con este símbolo, consultar la documentación del producto a fin de obtener mayor información sobre el producto.

ADVERTENCIA Una ADVERTENCIA en la documentación señala un riesgo que podría resultar en lesiones o la muerte.

PRECAUCION Una PRECAUCION en la documentación señala un riesgo que podría resultar en averías al equipo.

No proseguir después de un símbolo de ADVERTENCIA o PRECAUCION hasta no haber entendido las condiciones peligrosas y haber tomado las medidas apropiadas.

Este aparato se enmarca dentro de la clase I de seguridad y se encuentra protegido por una borna de puesta a tierra. Es preciso que exista una puesta a tierra continua desde la toma de alimentación eléctrica hasta las bornas de los cables de entrada del aparato, el cable de alimentación o el juego de cable de alimentación suministrado. Si existe la probabilidad de que la protección a tierra haya sufrido desperfectos, desenchufar el cable de alimentación hasta haberse subsanado el problema.

Puesta a tierra del cable de la red local (LAN):

- Si la LAN abarca un área cuyo suministro eléctrico proviene de más de una red de distribución de electricidad, cerciorarse de que las puestas a tierra estén conectadas entre sí de modo seguro.
- Es posible que los cables de la LAN se vean sometidos de vez en cuando a voltajes momentáneos que entrañen peligro (rayos o alteraciones en la red de energía eléctrica). Manejar con precaución los componentes de metal de la LAN que estén al descubierto.

Este aparato no contiene pieza alguna susceptible de reparación por parte del usuario. Todas las reparaciones, ajustes o servicio de mantenimiento debe realizarlos solamente el técnico.

Este producto no tiene interruptor de potencia; se activa cuando se enchufa el cable de alimentación.

Safety Information

安全性の考慮

安全記号

マニュアル参照記号。製品にこの記号がついている場合はマニュアルを参照し、注意事項等をご確認ください。

警告　　マニュアル中の「警告」は人身事故の原因となる危険を示します。

注意　　マニュアル中の「注意」は装置破損の原因となる危険を示します。

「警告」や「注意」の項は飛ばさないで必ずお読みください。危険性に関する記載事項をよく読み、正しい手順に従った上で次の事項に進んでください。

これは安全性クラスIの製品で保護用接地端子を備えています。主電源から製品の入力配線端子、電源コード、または添付の電源コード・セットまでの間、切れ目のない安全接地が存在することが必要です。もしこの保護回路が損なわれたことが推測されるときは、接地が修復されるまで電源コードを外しておいてください。

LANケーブルの接地に関して:

- もし貴社のLANが複数の配電システムにより電力を受けている領域をカバーしている場合には、それらのシステムの安全接地が確実に相互に結合されていることを確認してください。
- LANケーブルは時として危険な過度電圧(例えば雷や、配電設備の電力網での障害)にさらされることがあります。露出した金属部分の取扱には十分な注意をはらってください。

本製品の内部にはユーザーが修理できる部品はありません。サービス、調整、保守および修理はサービス訓練を受けた専門家におまかせください。

本製品には電源スイッチがありません。電源コードを接続したとき電源入となります。

Regulatory Statements

FCC Statement (For U.S.A. Only)
Federal Communications Commission Radio Frequency Interference Statement

Warning: This equipment generates, uses, and can radiate radio frequency energy. If it is not installed and used in accordance with the instruction manual, it may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

If this equipment causes interference to radio reception (which can be determined by unplugging the power cord from the equipment) try these measures: Re-orient the receiving antenna. Relocate the equipment with respect to the receiver. Plug the equipment and receiver into different branch circuits. Consult your dealer or an experienced technician for additional suggestions.

VCCI Class 1 (For Japan Only)

この装置は，第一種情報装置(商工業地域において使用されるべき情報装置)で商工業地域での電波障害防止を目的とした情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）基準に適合しております。

従って，住宅地域またはその隣接した地域で使用すると，ラジオ，テレビジョン受信機等に受信障害を与えることがあります。

取扱説明書に従って正しい取り扱いをして下さい。

Declaration of Conformity

The following Declaration of Conformity complies with ISO/IEC Guide 22 and EN 45014. It identifies the product, the manufacturer's name and address, and the applicable specifications that are recognized in the European community.

DECLARATION OF CONFORMITY

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: Hewlett-Packard Company

Manufacturer's Address: 8000 Foothills Blvd.
Roseville, CA 95678
U.S.A.

declares that the product:

Product Name: Fiber-Optic Hub Plus
Model Number: HP 28682A

conforms to the following Product Specifications:

Safety: EN 60950 / IEC 950

EMC: EN 55022 class A / CISPR-22 class A
EN 55101-2 / IEC 801-2 3 kV CD, 8 kV AD
EN 55101-3 / IEC 801-3 3 V/m
FTZ-1046/84 (VDE-B)

Supplementary Information:

None.

Roseville, October 24, 1991

Sandra L. Sheehan

Sandra L. Sheehan, Quality Manager

One-Year Limited Hardware Warranty

Hewlett-Packard warrants this computer hardware product against defects in materials and workmanship for a period of one year from receipt by the end user. If HP receives notice of such defects during the warranty period, HP will, at its option, either repair or replace products that prove to be defective.

Should HP be unable to repair or replace the product within a reasonable amount of time, Customer's alternative exclusive remedy shall be a refund of the purchase price upon return of the product.

Exclusions The above warranty shall not apply to defects resulting from: improper or inadequate maintenance by customer; customer-supplied software or interfacing; unauthorized modification or misuse; operation outside of the environmental specifications for the product; or improper site preparation and maintenance.

Warranty Limitations HP makes no other warranty, either expressed or implied, with respect to this product. HP specifically disclaims the implied warranties of merchantability and fitness for a particular purpose. Some states or provinces do not allow limitations on the duration of an implied warranty, so the above limitation or exclusion might not apply to you. However, any implied warranty of merchantability or fitness is limited to the one-year duration of this written warranty.

This warranty gives you specific legal rights, and you might also have other rights which vary from state to state, or province to province.

Exclusive Remedies The remedies provided herein are Customer's sole and exclusive remedies. In no event shall HP be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory. Some states or provinces do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion might not apply to you.

Third-Party Products HP designed the HP 28682A Fiber-Optic Hub Plus to operate with industry-standard hardware and software products.

HP has conducted limited testing with certain non-HP products to determine compatibility with the HP 28682A Fiber-Optic Hub Plus. Please contact your HP authorized LAN dealer or HP representative for the current list of tested products.

HP relies in part upon information from the suppliers of non-HP products and makes no warranty, expressed or implied, with respect to the operation of these products or their compliance with worldwide regulatory requirements. HP advises customers to conduct independent examination to determine suitable levels of compatibility for the customer's individual needs.

Gewährleistung

HP gewährleistet, daß die Geräte frei von Material- und Fabrikationsfehlern sind. Die Gewährleistungsfrist beträgt ein Jahr ab Lieferung. Etwaige fehlerhafte Geräte werden nach eigenem Ermessen repariert oder ersetzt.

Garantía

Esta pieza de hardware está garantizada por HP contra defectos de materiales o manufactura por un período de un año a partir del momento en que el usuario la recibe. Durante dicho período de garantía, HP o un distribuidor autorizado reparará o reemplazará según su criterio, aquellos productos que resulten defectuosos.

Garantie

Hewlett-Packard garantit le matériel d'informatique personnelle contre tout défaut de matière et de fabrication pour une période d'un an à compter de la réception du matériel par l'utilisateur. Hewlett-Packard ou le distributeur agréé HP choisira de remplacer ou de réparer tout produit défectueux.

Garanzia

La Hewlett-Packard garantisce i propri prodotti hardware per computer contro i difetti di materiali e di fabbricazione per un periodo di 12 mesi dal giorno in cui li riceve l'utente finale. Durante il periodo di garanzia, la Hewlett-Packard o un Rivenditore autorizzato riparerà o sostituirà i prodotti che risultassero difettosi.

Regulatory Information

The product described in this document complies with specific international regulations. See the document section entitled “Regulatory Statements” for the applicable regulatory information.

Informations concernant la réglementation

Le produit décrit dans le présent document satisfait à des normes internationales spécifiques. Pour plus de détails sur les réglementations applicables, reportez-vous à la section «Regulatory Statements».

Informationen über Kontrollvorschriften

Das in diesem Dokument beschriebene Produkt erfüllt bestimmte internationale Kontrollvorschriften. Für Informationen über die zutreffenden Kontrollvorschriften lesen Sie bitte das Kapitel mit der Überschrift “Regulatory Statements”.

Informazioni sulla regolamentazione

Il prodotto descritto in questo documento è conforme alle specifiche normative internazionali. Vedere la sezione del documento intitolata “Regulatory Statements” per le informazioni sulle normative competenti.

Informacin reglamentaria

El producto que se describe en este documento cumple con determinados reglamentos internacionales. En cuanto a la información reglamentaria correspondiente, ver la sección del documento titulada “Regulatory Statements”.

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